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Multifunctional betanin nanoliposomes-incorporated gelatin/chitosan nanofiber/ZnO nanoparticles nanocomposite film for fresh beef preservation

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Abstract

The objective of this study was to fabricate betanin nanoliposomes incorporated gelatin/chitosan nanofiber/ZnO nanoparticles bionanocomposite film (G/CH NF/ZnO NPs/B NLPs) and investigate its effects on the preservation of fresh beef. The scanning electron microscopy image of nanocomposite film displayed a good inter-connective porous morphology. Fourier transform infrared and X-ray diffraction analysis confirmed the formation of new hydrogen bonds and enhanced crystallinity through the addition of CH NF, ZnO NPs, and B NLPs. The G/CH NF/ZnO NPs/B NLPs film exhibited satisfactory mechanical properties and high surface hydrophobicity (water contact angle = 92.49 ± 3.71°). The incorporation of ZnO NPs and B NLPs in the nanocomposite film provided high antibacterial activity and DPPH inhibition activity (53.02 ± 3.26%). The growth of inoculated bacteria, lipid oxidation, and the changes in the pH and color quality of the beef samples were controlled by packaging with the fabricated film. In conclusion, the G/CH NF/ZnO NPs/B NLPs nanocomposite has a high potential for meat preservation